surface of the foot, as well as at other foot locations. Detection of shear during footwear fitting can result in identification of better fitting footwear, which generally and desirably reduces the incidence and severity of shear and the consequent hotspots and injury.

[0056] While specific examples of sensor systems and pressure sensor placement has been described with reference to garments having a sock form factor, it will be appreciated that pressure sensors may be used with (and/or applied to) other types of wearable garments (e.g., underwear, t-shirts, trousers, tights, leggings, hats, gloves, bands, and the like), and dedicated electronic devices having different configurations may be designed to interface with a variety of sensor systems embodied in different types of garments. Similar types of flexible e-textile sensors may be applied to or associated with a wide variety of non-conductive underlying flexible substrate materials, including woven and non-woven materials, and incorporated in a variety of sensor systems. The sensor systems interface with one or more intermediate electronic devices, as described above, and data may be processed and analyzed, with feed back provided by a centralized host system.

[0057] In some embodiments, feedback such as 2-dimensional and/or 3-dimensional pressure and/or force and/or shear maps of the user's foot provides visualization of areas of high and low pressure, force and/or shear during sitting, standing and various activities. 2D and 3D maps may be color coded to highlight areas of higher intensity and may be streamed to a display device to provide a real-time feedback and mapping during movement. In some embodiments, raw force and/or pressure and/or shear data collected during various user activities (sitting, standing, moving) may be processed and manipulated to display gait pressure curves determined independently at the various sensors or at spatial locations within each sensor. Various sensor data may be combined, averaged, analyzed, etc. to provide different types of feedback in different feedback formats.

[0058] Although these specific embodiments have been illustrated and described with reference to the wearable substrate having a sock form factor, it will be appreciated that these specifically disclosed embodiments are non-limiting and the sensors, leads, traces and terminals, as well as different types of DEDs may be adapted for use in other types of garment and non-garment applications.

[0059] In one exemplary methodology of the present disclosure, a garment, independently positionable sensing system, bandage or the like, having one or more sensing systems as described herein, is positioned on a user with sensor(s) positioned in proximity to a body area desired to be monitored. A dedicated electronic device is mounted to/on or associated with signal transfer terminals of the sensing system and an authentication protocol is initiated to match the garment/sensing system to the user. The authentication protocol optionally loads user data, profile information, and the like, to one or more hosted systems, such as a centralized data processing and analysis facility, a medical records facility, a caretaker system, or the like. Sensor calibration may then be conducted based on user-specific information, conditions, and the like, and thresholds, limits or specific ranges, monitoring protocols, notifications, alerts, and the like may be selected by the user, a caretaker, clinician, or by the system to apply user-specific monitoring routines, parameters, and the like. Intermittent or substantially continuous user monitoring may then be initiated, with monitoring data and results provided to the user, a centralized data processing and analysis facility, a medical records facility, a caretaker system, clinician dashboard, footwear or garment manufacturer, and the like. Changes and updates to monitoring protocols may be implemented based on monitoring feedback, changes in user conditions, etc.

[0060] In one specific example of recommendations made based on clustering, consider the following scenario: "Provide the best fitting shoe recommendation for a specific customer based on the entire population data." The assumption is that people with similar anatomical features will experience similar comfort or pain levels in wearing a shoe. Therefore, individuals having similar individual foot and body structural features provide the best basis for footwear fit predictions.

[0061] Consider a user (or foot) profile with the following features: Gender, Age, Weight, Height, Foot Size, Arch Type, Pronation Type, Prevalent Activity type, intensity, frequency, and the like. Let's also consider the following information provided by (some or all) users: Brand (make, model) of shoes worn; subjective fitting information, including Size Fit, Width Fit, Arch Support, Comfort, and Frequency of Usage. The system will cluster the user population based on the user (foot) profile data. The resulting clusters identify groups having affinity (similar characteristics) across selected data categories. Depending on the number of features we select in a specific query, different groups can result (e.g. subjects [male, age 40, over-pronating] vs. [male, age 40, over-pronating, size 10.5]). An additional classification may cluster the shoes, in relation to users, based on the subjective fitting information provided by each user. A ranked list of shoes may be assembled based on the fitting information for each specific cluster of users and used to provide user-specific feedback.

[0062] For example, let A, B, C be three clusters of users in our population. Let **S1**, **S2**, . . . SN be a set of shoes that the population has come to try/wear. For each cluster, the collection of shoes SJ . . . SN may be ranked based on relative relevance of such shoes for the sub-population of users in the cluster. For example, **S1** is recommended favorably by 5 users in cluster A, 2 users in cluster B, 0 users in cluster C. **S2** is recommended favorably by 3 users in cluster A, 2 users in cluster B, I 0 users in cluster C. **S3** is recommended favorably by I user in cluster A, 5 users in cluster B, 2 users in cluster C. Also, **S1** is negatively recommended by I users in cluster A, I users in cluster B, 3 users in cluster C. Assuming, for the sake of simplicity, that a favorable recommendation counts as +1, while a negative recommendation counts as −1. The resulting ranked list for cluster A is (**S1**, **S2**, **S3**) (total rank. −4, 3, 1); the resulting ranked list for cluster B is (**S3**, **S2**, **S1**) (total rank: 5, 2, I). The resulting ranked list for cluster C is (**S2**, **S3**) (total rank: 10, 2, −3). The calculation of relevance for the ranking algorithm is generally more sophisticated, because the evaluation of the shoe is more granular (using, for example, a rank of 1 to 5 for each of the subjective fitting attributes assigned by each user on a shoe).

[0063] After the classification is performed, a user can receive shoe recommendations simply by providing their foot profile. The recommendation will be accurate as long as enough data points (i.e., a sufficient data population) are available in the knowledge base. Users may also be able to